FORM PTO-1390 (Modified) (REV 11-2000) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER: **213050US0XPCT**

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR): 09/926453

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/JP00/02737	**26 April 2000**	**06 May 1999**

TITLE OF INVENTION
ADSORBENTS MADE OF STYRENE POLYMERS

APPLICANT(S) FOR DO/EO/US
Yoshiharu TSUJITA, et al.

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include itens (5), (6), (9) and (24) indicated below.
4. ☒ The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371 (c) (2))
   a. ☐ is attached hereto (required only if not communicated by the International Bureau).
   b. ☒ has been communicated by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
   a. ☒ is attached hereto.
   b. ☐ has been previously submitted under 35 U.S.C. 154(d)(4).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))
   a. ☐ are attached hereto (required only if not communicated by the International Bureau).
   b. ☐ have been communicated by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☒ have not been made and will not be made.
8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
10. ☐ An English language translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).
11. ☐ A copy of the International Preliminary Examination Report (PCT/IPEA/409).
12. ☒ A copy of the International Search Report (PCT/ISA/210).

Items 13 to 20 below concern document(s) or information included:

13. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
14. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
15. ☒ A **FIRST** preliminary amendment.
16. ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
17. ☐ A substitute specification.
18. ☐ A change of power of attorney and/or address letter.
19. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.
20. ☐ A second copy of the published international application under 35 U.S.C. 154(d)(4).
21. ☐ A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
22. ☐ Certificate of Mailing by Express Mail
23. ☒ Other items or information:

PC/IB/304
PCT/IB/308
Notice of Priority
Request for Consideration of Documents Cited in the International Search Report

U.S. APPLICATION NO (IF KNOWN, SEE 37 CFR) 09/926453	INTERNATIONAL APPLICATION NO. PCT/JP00/02737	ATTORNEY'S DOCKET NUMBER 213050US0XPCT

24. The following fees are submitted:.		CALCULATIONS PTO USE ONLY	
BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)) :			
☐ Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO	$1040.00		
☒ International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO	$890.00		
☐ International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO	$740.00		
☐ International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4)	$710.00		
☐ International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4)	$100.00		
ENTER APPROPRIATE BASIC FEE AMOUNT =		$890.00	
Surcharge of **$130.00** for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (e)).		$0.00	

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	12 - 20 =	0	x $18.00	$0.00	
Independent claims	1 - 3 =	0	x $84.00	$0.00	
Multiple Dependent Claims **(check if applicable)**.			☐	$0.00	

TOTAL OF ABOVE CALCULATIONS =	$890.00	
☐ Applicant claims small entity status. See 37 CFR 1.27). The fees indicated above are reduced by 1/2.	$0.00	
SUBTOTAL =	$890.00	
Processing fee of **$130.00** for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (f)). +	$0.00	
TOTAL NATIONAL FEE =	$890.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) **(check if applicable).** ☐	$0.00	
TOTAL FEES ENCLOSED =	$890.00	
	Amount to be: refunded	$
	charged	$

a. ☒ A check in the amount of **$890.00** to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. _____ in the amount of _____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. **15-0030** A duplicate copy of this sheet is enclosed.

d. ☐ Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. **Credit card information should not be included on this form.** Provide credit card information and authorization on PTO-2038.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

Telephone: (703)413-3000
Fax: (703)413-2220

Surinder Sachar
Registration No. 34,423

22850

Surinder Sachar
SIGNATURE

Norman F. Oblon
NAME

24,618
REGISTRATION NUMBER

Nov. 6 2001
DATE

213050US-0X PCT

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF: :

YOSHIHARU TSUJITA ET AL : ATTN: APPLICATION DIVISION

SERIAL NO: NEW U.S. PCT APPLN :
(BASED ON PCT/JP00/02737)

FILED: HEREWITH :

FOR: ADSORBENTS MADE OF STYRENE POLYMERS

PRELIMINARY AMENDMENT

ASSISTANT COMMISSIONER FOR PATENTS
WASHINGTON, D.C. 20231

SIR:

Prior to examination on the merits, please amend the above-identified application as follows.

IN THE CLAIMS Please amend the claims as shown on the marked-up copy following this amendment to read as follows.

5. (Amended) The adsorbent, which is produced as claimed in claim 2 [or 3], wherein removing the organic compound is performed by evaporation under reduced pressure.

6. (Amended) The adsorbent, which is produced as claimed in claim 2 [or 3], wherein the organic compound is an aromatic compound.

7. (Amended) The adsorbent as claimed in claim 6, wherein the aromatic compound is selected from the group consisting of benzene, toluene, xylene, chlorobenzene, bromobenzene, dichlorobenzene, and trichlorobenzene.

Please add new Claims 10-12.

10. (New) The adsorbent, which is produced as claimed in claim 3, wherein removing the organic compound is performed by evaporation under reduced pressure.

11. (New) The adsorbent, which is produced as claimed in claim 3, wherein the organic compound is an aromatic compound.

12. (New) The adsorbent as claimed in claim 11, wherein the aromatic compound is selected from the group consisting of benzene, toluene, xylene, chlorobenzene, bromobenzene, dichlorobenzene, and trichlorobenzene.

REMARKS

Claims 1-12 are active in the present application. Claims 5-7 have been amended to remove multiple dependencies and for clarity. Claims 10-12 are new claims supported by the original claims. No new matter is added. An action on the merits and allowance of claims is solicited.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.

Norman F. Oblon
Attorney of Record
Registration No. 24,618

Daniel J. Pereira, Ph.D.
Registration No. 45,518

22850

(703) 413-3000
Fax #: (703)413-2220
NFO/DJPER/SUKOS/js

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Marked-Up Copy
Serial No: _____
Amendment Filed on:
11-6-01

IN THE CLAIMS

--5. (Amended) The adsorbent, which is produced as claimed in claim 2 [or 3], wherein [the] removing the organic compound is performed by evaporation under reduced pressure.

6. (Amended) The adsorbent, which is produced as claimed in claim 2 [or 3], wherein the organic compound is an aromatic compound.

7. (Amended) The adsorbent as claimed in claim 6, wherein the aromatic compound is [at least one] selected from the group consisting of benzene, toluene, xylene, chlorobenzene, bromobenzene, dichlorobenzene, and trichlorobenzene.--

Claims 10-12 (New).

DESCRIPTION

ADSORBENTS MADE OF STYRENE POLYMERS

TECHNICAL FIELD

The present invention relates to an adsorbent comprising a substantially syndiotactic styrene polymer, more precisely, to such an adsorbent comprising a substantially syndiotactic styrene polymer, of which the pore size is equivalent to the molecular size of an organic compound to be adsorbed by it.

BACKGROUND ART

For removing an organic compound such as a hydrocarbon compound, fuel, solvent or the like, from gases or liquid that contains it, heretofore employed is a method comprising feeding a gas or liquid into an adsorption column filled with an adsorbent such as zeolite, activated alumina or the like, followed by making the organic compound adsorbed by the adsorbent to thereby remove the organic compound from the gas or liquid. The organic compound thus adsorbed by the adsorbent in the method is desorbed from it by feeding water vapor or the like into the adsorption column, expelled from the column along with the water vapor, and recovered and recycled.

However, the inorganic porous substance used in the method has some drawbacks in that it is limited in point of its crystal morphology and therefore the size of the organic

compound capable of being adsorbed by it is limited, and in that its structure could not all the time correspond to the size of a specific organic compound which is intended to be adsorbed by it and therefore it cannot selectively adsorb the specific compound from a mixture of compounds having similar molecular morphologies.

In case where the device as above is difficult to install in printing factories, painting factories, etc., the solvent used in such factories is not removed and recovered satisfactorily, and a simple method of removing and recovering organic compounds is desired.

Also desired is a method of efficiently removing and recovering impurities from liquids, not requiring distillation.

The present invention is to provide an adsorbent capable of selectively and efficiently adsorbing an organic compound existing in gases or liquids.

DISCLOSURE OF THE INVENTION

We, the present inventors have assiduously studied to attain the object as above, and, as a result, have found that an adsorbent produced by forming a complex of a syndiotactic polystyrene with an organic compound followed by shaping it and removing the organic compound from the shaped article through evaporation can selectively and efficiently adsorb the organic compound. On the basis of this finding, we have completed the

present invention.

Specifically, the invention provides the following:

1. An adsorbent comprising a substantially syndiotactic styrene polymer.

2. The adsorbent of above 1, which is produced by forming a complex of a substantially syndiotactic styrene polymer with at least one selected from an organic compound and a solvent of which the molecular size is equivalent to that of the organic compound, followed by shaping the complex, and thereafter removing the organic compound or the solvent from the shaped article without substantially changing the crystal structure of the styrene polymer in the shaped article.

3. The adsorbent of above 1, which is produced by dissolving or swelling a substantially syndiotactic styrene polymer in an organic compound having an affinity for the polymer, followed by shaping it, and thereafter removing the organic compound from the shaped article.

4. The adsorbent, which is produced as above 2, wherein the shaping the complex is performed by a melt-casting process.

5. The adsorbent, which is produced as above 2 or 3, wherein the removing the organic compound is performed by evaporation under reduced pressure.

6. The adsorbent , which is produced as above 2 or 3, wherein the organic compound is an aromatic compound.

7. The adsorbent of above 6, wherein the aromatic

compound is at least one selected from benzene, toluene, xylene, chlorobenzene, bromobenzene, dichlorobenzene, and trichlorobenzene.

8. The adsorbent of above 1, which is for adsorbing an organic compound.

9. The adsorbent of above 1, which is produced by forming a complex of a substantially syndiotactic styrene polymer with at least one selected from an organic compound and a solvent of which the molecular size is equivalent to that of the organic compound, melt-spinning the complex into fibers after or while the complex is formed, and thereafter removing the organic compound or the solvent from the fibers without substantially changing the crystal structure of the styrene polymer in the fibers.

The complex of a substantially syndiotactic styrene polymer with an organic compound is meant to indicate that the styrene polymer therein carries the organic compound in its crystal structure with keeping its crystal structure in some degree.

BEST MODES OF CARRYING OUT THE INVENTION

Embodiments of the invention are described hereunder.

1. Substantially syndiotactic styrene polymer:

Of a styrene polymer having a syndiotactic polystyrene structure (this will be referred to as "syndiotactic polystyrene" or "SPS"), the syndiotactic structure indicates

the stereo-structure of the polymer, in which the side chains of phenyl groups are alternately positioned on the opposite sides relative to the main chain composed of carbon-carbon bonds, and its tacticity is determined according to the nuclear magnetic resonance of the polymer with an isotopic carbon (^{13}C-NMR). The tacticity to be determined according to ^{13}C-NMR indicates the proportion of a plurality of continuous constitutional units in a polymer. For example, a polymer comprising two continuous constitutional units is referred to as a diad; that comprising three continuous constitutional units is referred to as a triad; and that comprising five continuous constitutional units is referred to as a pentad. The substantially syndiotactic styrene polymer for use in the invention generally has a racemic diad syndiotacticity of at least 75 %, preferably at least 85 %, or has a racemic pentad syndiotacticity of at least 30 %, preferably at least 50 %, including, for example, polystyrene, poly(alkylstyrenes), poly(halogenostyrenes), poly(halogenoalkylstyrenes), poly(alkoxystyrenes), poly(vinylbenzoates), hydrogenated derivatives of those polymers, their mixtures, and copolymers consisting essentially of those polymers.

The poly(alkylstyrenes) include poly(methylstyrene), poly(ethylstyrene), poly(isopropylstyrene), poly(tert-butylstyrene), poly(phenylstyrene), poly(vinylnaphthalene), poly(vinylstyrene), etc. The poly(halogenostyrenes) include

poly(chlorostyrene), poly(bromostyrene), poly(fluorostyrene), etc. The poly(halogenoalkylstyrenes) include poly(chloromethylstyrene), etc.; and the poly(alkoxystyrenes) include poly(methoxystyrene), poly(ethoxystyrene), etc.

Of those styrene polymers, preferred are polystyrene, poly(p-methylstyrene), poly(m-methylstyrene), poly(p-tert-butylstyrene), poly(p-chlorostyrene), poly(m-chlorostyrene), poly(p-fluorostyrene), hydrogenated polystyrene, and copolymers comprising those constitutional units.

The styrene polymer for use in the invention generally has a weight-average molecular weight of from thousands to 1,000,000, preferably from 10,000 to 500,000.

For producing the substantially syndiotactic polystyrene, any known method is employable. For example, employed is a method of polymerizing a styrene monomer (corresponding to the styrene polymer to be produced) in the presence of a catalyst of a condensation product of a titanium compound, water and a trialkylaluminium, in or not in an inert hydrocarbon solvent (Japanese Patent Laid-Open No. 187708/1987). For producing poly(halogenoalkylstyrenes) and their hydrogenated derivatives, also employable is any known method. For example, the methods described in Japanese Patent Laid-Open Nos. 46912/1989 and 178505/1989 may be employed for them.

2. Method for producing adsorbent that comprises the styrene

polymer:

For producing the adsorbent of the invention capable of selectively adsorbing an organic compound, one typical method comprises forming a complex of SPS with the intended organic compound or a solvent of which the molecular size is equivalent to that of the organic compound, then casting a solution of the complex to form an SPS film, and heating it at a relatively low temperature for a long period of time to thereby remove the organic compound or the solvent from the complex. In the adsorbent produced according to the method, formed is a site of which the size and the morphology correspond to those of the organic compound.

In the solution casting method, the SPS concentration preferably falls between 0.1 and 50 % by weight, more preferably between 0.5 and 10 % by weight, though depending on the solvent used. Also preferably, the casting condition is so controlled that the film has, just after cast, a thickness of from 10 to 1000 μm. If the film thickness oversteps the defined range, the desired site could not be formed in the adsorbent produced.

In the heat treatment step, the temperature may fall between -50 and 200°C, but preferably between -20 and 180°C, and the time for the treatment may fall between 10 seconds and 8 hours, but preferably between 30 seconds and 1 hour. If they overstep the defined ranges, the desired site could not be formed in the adsorbent produced.

For removing the organic compound or the solvent from it, the shaped article may be processed in vacuum. In this case, it is desirable that the system is gradually degassed in order that the desired site in the shaped article is not broken by too rapid pressure change.

Another method for producing the adsorbent of the invention comprises dissolving or swelling powder or pellets of SPS in an organic compound or in a solvent of which the molecular size is equivalent to that of the organic compound, followed by drying it in vacuum under the condition for forming a complex of SPS with the organic compound or the solvent. Also in the method, produced is the intended adsorbent having a site that corresponds to the size and the morphology of the organic compound.

Still another method for producing the adsorbent of the invention comprises forming the SPS complex, and, after or while the complex is formed, melt-spinning it into fibers in an ordinary process generally employed in producing ordinary synthetic fibers, and thereafter removing the organic compound or the solvent from the fibers. Also in the method, produced is the intended adsorbent having a site that corresponds to the size and the morphology of the organic compound.

If desired, the fibers may be drawn.

3. Organic compound capable of being adsorbed by the adsorbent:

The organic compound to be used in producing the adsorbent

of the invention may be any and every one capable of forming a complex with SPS, but is preferably one having a solubility parameter $(J/m^{-3})^{1/2}$ of from 14×10^{-3} to 22×10^{-3}. The organic compound to dissolve or swell SPS in producing the adsorbent of the invention shall have a solubility parameter falling within the defined range; and the organic compound to be adsorbed by the adsorbent must be on the same level as that of the organic compound having been used in producing the adsorbent, in point of the molecular size. For example, in case where SPS is dissolved in p-xylene for producing an adsorbent, the adsorbent produced can adsorb p-xylene but does not adsorb m-xylene of which the molecular size is larger than that of p-xylene.

Concretely, the organic compound usable herein include aromatic compounds such as benzene, toluene, xylene, chlorobenzene, bromobenzene, dichlorobenzene, trichlorobenzene and their isomers; and non-aromatic compounds such as cis-decalin, trans-decalin, methylene chloride, chloroform, carbon tetrachloride, acetone, etc.

The solvent of which the molecular size is equivalent to that of the organic compound as above may be any and every one capable of forming a site that corresponds to the size and the morphology of the organic compound to be adsorbed by the adsorbent of the invention, and concretely includes the above-mentioned organic compounds.

The organic compound having an affinity for SPS may be the same as the organic compound mentioned above. Especially preferred for it are aromatic compounds such as those mentioned above.

The invention is described in more detail with reference to the following Examples.

[Example 1]

1. Formation of adsorbent by the use of organic solvent:

Syndiotactic polystyrene (Idemitsu Petrochemical's neat polymer, having a weight-average molecular weight, Mw, of 211,000, and a ratio of weight-average molecular weight Mw to number-average molecular weight Mn, Mw/Mn of 3.45) was dissolved in p-xylene at a temperature of 100°C to prepare a 2 wt.% solution of the polymer in p-xylene, and the resulting solution was formed into a film according to a spin-casting process. This was put into a vacuum oven, and heated therein at 90°C under 10 mmHg for 1 hour to obtain one gram of an adsorbent. In this, p-xylene has a solubility parameter of 17.6×10^{-3}.

2. Effect of the adsorbent:

One gram of the adsorbent was brought into contact with 100 ml of water containing 1000 ppm of p-xylene and 1000 ppm of m-xylene dissolved therein, and kept as such at room temperature for one full day. After that, the concentration of p-xylene and m-xylene in water was measured. No p-xylene was detected in water, but the concentration of m-xylene in

water was not changed. The concentration analysis was effected through gas chromatography.

3. Analysis of adsorbent:

After the test in 2, the adsorbent was then spontaneously dried, and a part of it was heated, whereupon the gas generated by it was analyzed through gas chromatography. The gas contained p-xylene.

This confirms that p-xylene was adsorbed by the adsorbent, and p-xylene can be removed and recovered by heating the adsorbent.

[Example 2]

1. Formation of adsorbent by the use of organic solvent:

20 g of syndiotactic polystyrene (Idemitsu Petrochemical's neat polymer, having a weight-average molecular weight, Mw, of 211,000, and a ratio of weight-average molecular weight Mw to number-average molecular weight Mn, Mw/Mn of 3.45) was swollen in 100 ml of toluene at 80°C, and this was put into a vacuum oven and heated therein at 80°C under 10 mmHg for 1 hour to obtain 20 g of an adsorbent. In this, toluene has a solubility parameter of 17.8×10^{-3}.

2. Effect of the adsorbent:

5 g of the adsorbent was brought into contact with 500 ml of water containing 1000 ppm of p-xylene and 1000 ppm of m-xylene dissolved therein, and kept as such at room temperature for one full day. After that, the concentration of p-xylene

and m-xylene in water was measured. No p-xylene was detected in water, but the concentration of m-xylene in water was not changed. The concentration analysis was effected through gas chromatography.

[Example 3]

The same process as in Example 2 was repeated, except that methanol and not water was used in the step 2 of Example 2.

No p-xylene was detected in water, but the concentration of m-xylene in water was not changed.

[Example 4]

The same process as in Example 2 was repeated, except that hexane (having a solubility parameter of 14.6×10^{-3}) and not m-xylene was used in the step 2 of Example 2.

No p-xylene was detected in water, but the concentration of hexane in water was not changed.

[Example 5]

The same process as in Example 2 was repeated, except that toluene (having a solubility parameter of 17.8×10^{-3}) and not p-xylene was used in the step 2 of Example 2.

No toluene was detected in water, but the concentration of m-xylene in water was not changed.

[Example 6]

The same process as in Example 2 was repeated, except that chloroform (having a solubility parameter of 18.6×10^{-3}) and not toluene was used in the step 1 of Example 2 and that

chloroform and not p-xylene was used in the step 2 thereof.

No chloroform was detected in water, but the concentration of m-xylene in water was not changed.

INDUSTRIAL APPLICABILITY

The present invention provides an adsorbent capable of selectively and efficiently adsorbing an organic compound in gases or liquids.

The organic compound adsorbed by the adsorbent can be efficiently recovered.

CLAIMS

1. An adsorbent comprising a substantially syndiotactic styrene polymer.

2. The adsorbent as claimed in claim 1, which is produced by forming a complex of a substantially syndiotactic styrene polymer with at least one selected from an organic compound and a solvent of which the molecular size is equivalent to that of the organic compound, followed by shaping the complex, and thereafter removing the organic compound or the solvent from the shaped article without substantially changing the crystal structure of the styrene polymer in the shaped article.

3. The adsorbent as claimed in claim 1, which is produced by dissolving or swelling a substantially syndiotactic styrene polymer in an organic compound having an affinity for the polymer, followed by shaping it, and thereafter removing the organic compound from the shaped article.

4. The adsorbent, which is produced as claimed in claim 2, wherein the shaping the complex is performed by a melt-casting process.

5. The adsorbent, which is produced as claimed in claim 2 or 3, wherein the removing the organic compound is performed by evaporation under reduced pressure.

6. The adsorbent, which is produced as claimed in claim 2 or 3, wherein the organic compound is an aromatic compound.

7. The adsorbent as claimed in claim 6, wherein the

aromatic compound is at least one selected from benzene, toluene, xylene, chlorobenzene, bromobenzene, dichlorobenzene, and trichlorobenzene.

8. The adsorbent as claimed in claim 1, which is for adsorbing an organic compound.

9. The adsorbent as claimed in claim 1, which is produced by forming a complex of a substantially syndiotactic styrene polymer with at least one selected from an organic compound and a solvent of which the molecular size is equivalent to that of the organic compound, melt-spinning the complex into fibers after or while the complex is formed, and thereafter removing the organic compound or the solvent from the fibers not substantially changing the crystal structure of the styrene polymer in the fibers.

Declaration, Power Of Attorney and Petition

WE (I) the undersigned inventor(s), hereby declare(s) that:

My residence, post office address and citizenship are as stated below next to my name,

We (I) believe that we are (I am) the original, first, and joint (sole) inventor(s) of the subject matter which is claimed and for which a patent is sought on the invention entitled

ADSORBENTS MADE OF STYRENE POLYMERS

the specification of which

☐ is attached hereto.

☐ was filed on ____________ as Application Serial No. ____________ and amended on ____________

☑ was filed as PCT international application

Number PCT/JP00/02737

on April 26, 2000,

and was amended under PCT Article 19

on ____________(if applicable).

We (I) hereby state that we (I) have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

We (I) acknowledge the duty to disclose information known to be material to the patentability of this application as defined in Section 1.56 of Title 37 Code of Federal Regulations.

We (I) hereby claim foreign priority benefits under 35 U.S.C. § 119(a)-(d) or § 365(b) of any foreign application(s) for patent or inventor's certificate, or § 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or PCT International application having a filing date before that of the application on which priority is claimed. Prior Foreign Application(s)

Application No.	Country	Day/Month/Year	Priority Claimed
11-125960	Japan	6/ 5/1999	☑ Yes ☐ No
			☐ Yes ☐ No
			☐ Yes ☐ No
			☐ Yes ☐ No

We (I) hereby claim the benefit under Title 35, United States Code, § 119(e) of any United States provisional application(s) listed below.

(Application Number)	(Filing Date)
(Application Number)	(Filing Date)

We (I) hereby claim the benefit under 35 U.S.C. § 120 of any United States application(s), or § 365 (c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. § 112, I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR § 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application.

Application Serial No.	Filing Date	Status (pending, patented, abandoned)

And we (I) hereby appoint: Norman F. Oblon, Reg.No.24,618; Marvin J. Spivak, Reg.No.24,913; C. Irvin McClelland, Reg.No.21,124; Gregory J. Maier, Reg.No.25,599; Arthur I. Neustadt, Reg.No.24,854; Richiard D. Kelly, Reg.No.27,757; James D. Hamilton, Reg.No.28,421; Eckhard H. Kuesters, Reg.No.28,870; Robert T. Pous, Reg.No.29,099; Chiarles L. Gholz, Reg.No.26,395; Vincent J. Sunderdick, Reg.No.29,004; William E. Beaumont, Reg.No.30,996; Robert F. Gnuse, Reg.No.27,295; Jean-Paul Lavalleye, Reg.No.31,451; Stephen G. Baxter, Reg.No.32,884; Robert W. Hahl, Reg.No.33,893; Richiard L. Chinn, Reg.No.36,379; Steven P. Weihrouch, Reg.No.32,829; John T. Goolkasian, Reg.No.26,142; Richiard L. Chinn, Reg.No.34,305; Steven E. Lipman, Reg.No.30,001; Carl E. Schlier, Reg.No.34,426; James J. Kulbaski. Reg.No.34,648; Richiard A. Neifeld, Reg.No.35,299; J.Derek Mason, Reg. No.35,270; Surinder Sachar, Reg. No.34,423; Christina M. Gadiano. Reg. No.37,628; Jeffrey B. McIntyre, Reg.No.36,867; Paul E.Rauch, Reg.No.38,591; William T.Enos, Reg.No.33,128; and Micheal E. McCabe, Jr., Reg.No.37,182; our(my) attorneys, with full powers of substitution and revocation, to prosecute this application and to transact all business in the Patent Office connected therewith; and we(I) hereby request that all correspondence regarding this application be sent to the firm of OBLON, SPIVAK, McCLELLAND, MAIER & NEUSTADT, P.C., whose Post Office Address is: Fourth Floor, 1755 Jefferson Davis Highway, Arlington, Virginia 22202.

We (I) declare that all statements made herein of our (my) own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or important, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

100 Yoshiharu Tsujita
NAME OF FIRST SOLE INVENTOR

Yoshiharu Tsujita
Signature of Inventor

June 12, 2001
Date

Residence: C/O Nagoya Institute of Technology,
Gokiso-cho, Showa-ku, Nagoya-shi,
JPX Aichi 466-8555 Japan
Citizen of: Japan
Post Office Address: same as above

200 Norio Tomotsu
NAME OF SECOND JOINT INVENTOR

Norio Tomotsu
Signature of Inventor

May 1, 2001
Date

Residence: 1-1, Anesakikaigan,
Ichihara-shi, Chiba 299-0107 Japan
JPX

Citizen of : Japan

Post Office Address: same as above

NAME OF THIRD JOINT INVENTOR

Signature of Inventor

Date

Residence:

Citizen of :

Post Office Address:

NAME OF FOURTH JOINT INVENTOR

Signature of Inventor

Date

Residence:

Citizen of :

Post Office Address:

NAME OF FIFTH JOINT INVENTOR

Signature of Inventor

Date

Residence:

Citizen of :

Post Office Address: